

B. Amendments to the Claims

This listing of claims will replace the version of claims in the application, as originally filed:

Claim 1 (original): A lamp comprising:

(a) a waveguide having a body of a preselected shape and dimensions, the body comprising at least one dielectric material and having at least one surface determined by a waveguide outer surface, each said material having a dielectric constant greater than approximately 2;

(b) a first microwave probe positioned within and in intimate contact with the body, adapted to couple microwave energy into the body from a microwave source having an output and an input and operating within a frequency range from about 0.5 to about 30 GHz at a preselected frequency and intensity, the probe connected to the source output, said frequency and intensity and said body shape and dimensions selected so that the body resonates in at least one resonant mode having at least one electric field maximum;

(c) the body having at least one lamp chamber depending, respectively, from at least one said waveguide outer surface, each chamber at a location corresponding to an electric field maximum during operation; and

(d) a gas-fill in each chamber which when receiving microwave energy from the resonating body forms a light-emitting plasma.

Claim 2 (original): The lamp of claim 1 wherein each said dielectric material is a solid material.

Claim 3 (original): The lamp of claim 1 wherein each said dielectric material is a liquid material.

Claim 4 (original): The lamp of claim 1 wherein each said dielectric material is selected from the group consisting of solid materials having a dielectric constant greater than approximately 2, and liquid materials having a dielectric constant greater than approximately 2.

Claim 5 (original): The lamp of claim 2 or 3 or 4, wherein each said dielectric material has a loss tangent less than approximately 0.01.

Claim 6 (original): The lamp of claim 2 or 3 or 4, wherein each said dielectric material has a thermal shock resistance quantified by a failure temperature greater than approximately 200°C.

Claim 7 (original): The lamp of claim 2 or 3 or 4, wherein each said dielectric material has a DC breakdown threshold greater than approximately 200 kilovolts/inch.

Claim 8 (original): The lamp of claim 2 or 3 or 4, wherein each said dielectric material has a coefficient of thermal expansion less than approximately $10^{-5}/^{\circ}\text{C}$.

Claim 9 (original): The lamp of claim 2 or 3 or 4, wherein the dielectric constant of each said dielectric material has a zero or slightly negative temperature coefficient.

Claim 10 (original): The lamp of claim 2 or 3 or 4, wherein each said dielectric material has stoichiometric stability over a temperature range of about -80°C to about 1000°C.

Claim 11 (original): The lamp of claim 2 or 3 or 4, wherein each said dielectric material has a thermal conductivity of approximately 2 W/mK (watts per milliKelvin).

Claim 12 (original): The lamp of claim 2 or 3 or 4, wherein at least one waveguide outer surface has an outer coating of a metallic material.

Claim 13 (original): The lamp of claim 12 wherein a plurality of heat-sinking fins are attached to at least one said metallic outer coating.

Claim 14 (original): The lamp of claim 2 or 3 or 4, wherein the gas-fill in at least one said lamp chamber is contained within a bulb envelope comprising a surrounding wall hermetically coupled to a window covering the chamber, the window substantially transparent to the light emitted by the plasma.

Claim 15 (original): The lamp of claim 14, wherein at least one bulb envelope comprises at least one dielectric material having a dielectric constant greater than approximately 2.

Claim 16 (original): The lamp of claim 14, wherein at least one said bulb envelope is interior to said lamp chamber.

Claim 17 (original): The lamp of claim 14, wherein a portion of at least one said bulb envelope is exterior to said lamp chamber.

Claim 18 (original): The lamp of claim 16, wherein at least one said window comprises a focusing lens.

Claim 19 (original): The lamp of claim 17, wherein at least one said window comprises a focusing lens.

Claim 20 (currently amended): The lamp of claim 2 or 3 or 4, wherein the gas-fill in at least one said lamp chamber is contained within a self-enclosed, discrete bulb disposed therein, the chamber and bulb comprising a bulb cavity, the ~~discrete~~ bulb positioned at an electric field maximum and transparent to the light emitted by the plasma.

Claim 21 (original): The lamp of claim 2 or 3 or 4, wherein the gas-fill in each said lamp chamber comprises a plasma-forming gas and a light emitter.

Claim 22 (original): The lamp of claim 21, wherein the plasma-forming gas is a noble gas.

Claim 23 (original): The lamp of claim 21, wherein the light emitter is selected from the group consisting of sulfur, selenium, compounds containing sulfur, compounds containing selenium, and metal halides.

Claim 24 (original): The lamp of claim 2 or 3 or 4, wherein light emitted by the plasma is selected from the group consisting of ultraviolet light, visible light, and infrared light.

Claim 25 (original): The lamp of claim 2 or 3 or 4, wherein said operating frequency is in a range from about 0.5 GHz to about 10 GHz.

Claim 26 (original): The lamp of claim 2 or 3 or 4, wherein said body shape is a rectangular prism.

Claim 27 (original): The lamp of claim 2 or 3 or 4, wherein said body shape is a cylindrical prism.

Claim 28 (original): The lamp of claim 2 or 3 or 4, wherein said body shape is a sphere.

Claim 29 (original): The lamp of claim 2 or 3 or 4, wherein the first microwave probe and a lamp chamber are positioned proximate to the same electric field maximum.

Claim 30 (original): The lamp of claim 2 or 3 or 4, wherein the body resonates in a mode having at least two electric field maxima, and the first microwave probe and at least one lamp chamber are positioned proximate to different electric field maxima.

Claim 31 (original): The lamp of claim 2 or 3 or 4, wherein said operating frequency and intensity, and said body shape and dimensions are selected so that the body resonates at a high Q-value prior to plasma formation.

Claim 32 (original): The lamp of claim 2 or 3 or 4, wherein the first microwave probe has a reflectivity closely matching the reduced waveguide reflectivity after plasma formation.

Claim 33 (original): The lamp of claim 2 or 3 or 4, further comprising a second microwave probe positioned within the body.

Claim 34 (original): The lamp of claim 33, wherein the first and second microwave probes are each coupled to a separate microwave source.

Claim 35 (original): The lamp of claim 33, wherein the body resonates in a mode having at least three electric field maxima, and the first microwave probe, the second microwave probe, and at least one lamp chamber are each positioned proximate to different maxima.

Claim 36 (original): The lamp of claim 35, wherein:

(a) the first microwave probe, the second microwave probe, and at least one lamp chamber are each positioned proximate to an electric field maximum;

(b) the second microwave probe is connected to the microwave source input and probes the body to instantaneously sample the amplitude and phase of the electric field therein;

(c) the second probe feeds back the sampled amplitude and phase information to the source input; and

(d) the source amplifies the resonant energy within the body and dynamically adjusts the operating frequency to maintain at least one resonant mode within the body, thereby operating the lamp in a dielectric resonant oscillator mode.

Claim 37 (original): A lamp comprising:

(a) a waveguide having a body with a main portion comprising a solid dielectric material of a preselected shape and preselected dimensions, and a first body side;

(b) the body further having a protrusion extending from said first side and terminating in a second side determined by a waveguide outer surface from which depends a lamp chamber into the protrusion;

(c) a microwave probe positioned within and in intimate contact with the body main portion, adapted to couple microwave energy into the main portion from a microwave source having an output and an input and operating within a frequency range from about 0.5 to about 30 GHz at a preselected frequency and intensity, the probe connected to the source output, said frequency and intensity and said body main portion shape and dimensions selected such that the main portion resonates in at least one resonant mode having at least one electric field maximum; and

(d) a bulb envelope substantially within the cavity, containing a gas-fill which when receiving microwave energy from the resonating body main portion forms a light-emitting plasma.

Claim 38 (original): The lamp of claim 37 wherein the bulb envelope comprises:

(a) a window substantially transparent to the light emitted by the plasma; and

(b) an outer wall hermetically coupled with the window and shaped to direct light towards the window, said wall having a thermal expansion coefficient approximately equal to the thermal expansion coefficient of the window.

Claim 39 (original): The lamp of claim 38 wherein said solid dielectric material is a ceramic.

Claim 40 (currently amended): A lamp comprising:

(a) a waveguide having a body comprising a solid dielectric material of a preselected shape and preselected dimensions, the body having a first side determined by a first waveguide outer surface;

(b) the body having a lamp chamber depending from said waveguide outer surface, the chamber having an aperture circumscribed by a bulb ~~envelope~~ support structure sealed to said outer surface;

(c) a microwave probe positioned within and in intimate contact with the body, adapted to couple microwave energy into the body from a microwave source having an output and an input and operating within a frequency range from about 0.5 to about 30 GHz at a preselected frequency and intensity, the probe connected to the source output, said frequency and intensity and said body shape and dimensions selected such that the body resonates in at least one resonant mode having at least one electric field maximum; and

(d) a self-enclosed bulb ~~envelope~~ substantially within the lamp chamber and hermetically sealed to the bulb ~~envelope~~ support structure and separated from the waveguide body by a gap, the bulb ~~envelope~~ containing a gas-fill which when receiving microwave energy from the resonating body main portion forms a light-emitting plasma.

Claim 41 (currently amended): The lamp of claim 40 wherein the bulb envelope comprises:

- (a) a window substantially transparent to the light emitted by the plasma; and
- (b) a surrounding wall hermetically coupled with the window and shaped to direct light towards the window, said wall having a thermal expansion coefficient approximately equal to the thermal expansion coefficient of the window.

Claim 42 (original): The lamp of claim 41 wherein a vacuum is maintained in the cavity.

Claim 43 (original): The lamp of claim 42 wherein said solid dielectric material is a ceramic.

Claim 44 (original): A method for producing light comprising the steps of:

- (a) coupling microwave energy characterized by a frequency and intensity into a waveguide having a body of a preselected shape and dimensions, the body comprising at least one dielectric material and having at least one surface determined by a waveguide outer surface from which depends at least one lamp chamber into the body, each said material having a dielectric constant greater than approximately 2, said frequency and intensity and said body shape and dimensions selected such that the body resonates in a least one resonant mode having at least one electric field maximum;

(b) directing resonant microwave energy into the lamp chamber(s), each lamp chamber containing a gas-fill comprising a plasma-forming gas and a light emitter; and

(c) creating a plasma by interacting the resonant energy with the gas-fill, thereby causing emission of light.

Claim 45 (original): The method of claim 44, further comprising the steps of:

(a) sampling the amplitude and phase of the electric field within the waveguide body;
and

(b) adjusting the operating frequency of the microwave source until the sampled electric field is maximized.